

REMARKS

Claims 1-27 were pending in this application.

Claims 1-27 have been rejected.

Claims 5, 11, 14 and 18 have been amended as shown above.

Claims 1-27 remain pending in this application.

Reconsideration and full allowance of Claims 1-27 are respectfully requested.

I. OBJECTION TO CLAIMS

The Office Action objects to Claim 22 as being a substantial duplicate of Claim 23.

Claim 22 recites that a first column Hankel matrix comprises “a forward column Hankel matrix.” In contrast, Claim 23 recites that the first column Hankel matrix comprises “a backward column Hankel matrix.”

Claim 22 also recites that a second column Hankel matrix comprises “a backward column Hankel matrix.” In contrast, Claim 23 recites that the second column Hankel matrix comprises “a forward column Hankel matrix.”

Claim 22 is clearly not a “substantial duplicate” of Claim 23 given that the “forward” and “backward” limitations in the claims are reversed. Accordingly, the Applicant respectfully requests withdrawal of the objection to the claims.

II. REJECTION UNDER 35 U.S.C. § 112

The Office Action rejects Claims 5 and 14 under 35 U.S.C. § 112, second paragraph, as

being indefinite for failing to particularly point out and distinctly claim the subject matter regarded as the invention. The Applicant has amended Claims 5 and 14 to correct the noted informality.

Accordingly, the Applicant respectfully requests withdrawal of the § 112 rejection.

III. REJECTION UNDER 35 U.S.C. § 101

The Office Action rejects Claims 1-27 under 35 U.S.C. § 101 as being directed to non-statutory subject matter.

First, the Office Action states that “Claim 26 given its broadest reasonable interpretation exists as software only ... and thus is directed towards software *per se*.” However, Claim 26 recites both a “monitored system” and a “controller.” While the Office Action cites paragraph [0020] of the Applicant’s specification, this paragraph merely describes the controller. The Office Action provides no explanation as to how the “monitored system” in Claim 26 could possibly represent “software *per se*.” In fact, it is not possible to declare Claim 26 “software *per se*” given the definitions and examples of the “monitored system” provided in the Applicant’s specification (such as in paragraphs [0017]-[0018]).

Second, the Office Action asserts that Claims 1-27 are “directed to nonfunctional descriptive material *per se* which is an abstract idea and therefore is not statutory.” This assertion is improper. Claims 1, 11, 18, and 26 recite actually using (i) a projected matrix, (ii) an orthogonal matrix and an upper triangular matrix, or (iii) a projection of a matrix to at least partially isolate a “first portion” of a second signal from a “second portion” of the second signal

(where the “first portion” is associated with a first signal and the “second portion” is associated with at least one disturbance). Claim 27 recites actually using an orthogonal matrix and an upper triangular matrix to at least partially isolate “one or more effects of one or more disturbances in a signal.”

None of these claims can possibly represent “nonfunctional descriptive material per se.” According to MPEP § 2106.01, “nonfunctional descriptive material” includes but is not limited to music, literary works, and a compilation or mere arrangement of data. Claims 1, 11, 18, and 26 recite a method, an apparatus, a computer program, and a system that at least partially isolate one portion of a signal from another portion of the signal. Claim 27 recites a method that at least partially isolates “one or more effects of one or more disturbances” in a signal. None of this is “nonfunctional descriptive material per se” in any way.

Third, the Office Action is using an improper standard here. The Office Action appears to focus on the result produced by the claimed invention (a signal with at least partially isolated portions or a signal with one or more at least partially isolated disturbance effects) and asserts that this result is nonfunctional descriptive material per se. This is improper. MPEP § 2106 clearly states that a “claim as a whole must be considered” when determining compliance with § 101. The Patent Office cannot simply assert that the end result of a claimed invention is “nonfunctional descriptive material per se” and then declare the entire claimed invention to be non-statutory.

Fourth, the proper standard for determining compliance with § 101 requires that a claimed invention as a whole “must be useful and accomplish a practical application,” meaning it

must produce a “useful, concrete and tangible result.” (*MPEP* § 2106). A claimed invention is “useful” when it satisfies the utility requirement of § 101. (*MPEP* § 2106). In this application, there is no rejection of the claims as lacking utility under § 101. As a result, Claims 1-27 produce a “useful” result.

A claimed invention produces a “concrete” result when it can produce a result that is substantially repeatable or that substantially produces the same result again. (*MPEP* § 2106). There is no assertion by the Patent Office that the claimed invention in this application produces a result that is unpredictable or unrepeatable. There is also no assertion by the Patent Office that the claimed invention in this application fails to substantially produce the same result again. As a result, Claims 1-27 produce a “concrete” result.

A claimed invention produces a “tangible” result when a claim sets forth a “practical application” of a § 101 judicial exception to produce a “real-world result.” The “tangible” requirement does not require that a claim be tied to a particular machine or apparatus or that a claim operate to change articles or materials. (*MPEP* § 2106). Claims 1, 11, 18, and 26 recite using (i) a projected matrix, (ii) an orthogonal matrix and an upper triangular matrix, or (iii) a projection of a matrix to at least partially isolate a “first portion” of a second signal from a “second portion” of the second signal (where the “first portion” is associated with a first signal and the “second portion” is associated with at least one disturbance). Claim 27 recites using an orthogonal matrix and an upper triangular matrix to at least partially isolate “one or more effects of one or more disturbances in a signal.” Every single one of these claims involves a “practical application” (the isolation of part of a signal from another part of the signal or the isolation of

one or more disturbance effects in a signal) to produce a “real-world result” (an isolated signal with less noise, disturbance, etc.).

The Office Action’s position has no support in any statute, rule, case law, or MPEP section. The test for statutory subject matter is crystal clear – a claimed invention “as a whole” must be considered, and the claimed invention must produce a “useful, concrete, and tangible result.” Here, the Office Action fails to examine the claims as a whole. The Office Action fails to explain why the result produced by the claimed invention is not useful under § 101. The Office Action fails to explain why the result produced by the claimed invention is not concrete. The Office Action fails to explain why the result produced by the claimed invention is not tangible. Instead, the Office Action goes so far as to argue that a device having at least one memory and at least one processor for at least partially isolating a “first portion” of a signal from a “second portion” of the signal (as recited in Claim 11) is “nonfunctional descriptive material per se,” which is impossible given the definition of “nonfunctional descriptive material” provided in the MPEP.

The burden is on the Patent Office to establish that the claimed invention is non-statutory. The Patent Office has failed to meet this burden using the appropriate standard.

Accordingly, the Applicant respectfully requests withdrawal of the § 101 rejection.

IV. REJECTION UNDER 35 U.S.C. § 102

The Office Action rejects Claims 11-25 under 35 U.S.C. § 102(e) as being anticipated by U.S. Patent No. 6,615,164 to Gopisetty et al. (“*Gopisetty*”). This rejection is respectfully

traversed.

A prior art reference anticipates a claimed invention under 35 U.S.C. § 102 only if every element of the claimed invention is identically shown in that single reference, arranged as they are in the claims. (*MPEP* § 2131; *In re Bond*, 910 F.2d 831, 832, 15 U.S.P.Q.2d 1566, 1567 (*Fed. Cir.* 1990)). Anticipation is only shown where each and every limitation of the claimed invention is found in a single prior art reference. (*MPEP* § 2131; *In re Donohue*, 766 F.2d 531, 534, 226 U.S.P.Q. 619, 621 (*Fed. Cir.* 1985)).

The Office Action makes absolutely no attempt to show that *Gopisetty* discloses the majority of the elements in Claims 11-25. Rather, the Office Action improperly asserts that various elements in Claims 11-25 can be ignored because of the phrases “operable to” and “program for.”

Claim 11 has been amended to recite “at least one memory storing a matrix” and “at least one processor performing canonical QR-decomposition on the matrix ... and using the orthogonal matrix and the upper triangular matrix.” Nothing in Claim 11 is optional. Claim 11 cannot be anticipated by any computing device as asserted in the Office Action.

Claim 18 has been amended to recite a computer program that includes “computer readable program code for generating,” “computer readable program code for decomposing,” and “computer readable program code for using.” Again, nothing in Claim 18 is optional. Claim 18 requires a computer program to include “computer readable program code” for performing specific functions or steps. Claim 18 cannot be anticipated by any computer program as asserted in the Office Action.

For these reasons, *Gopisetty* fails to anticipate the Applicant's invention as recited in Claims 11 and 18 (and their dependent claims).

Accordingly, the Applicant respectfully requests withdrawal of the § 102 rejection and full allowance of Claims 11-25.

V. REJECTION UNDER 35 U.S.C. § 103

The Office Action rejects Claims 1-7, 11-15, 18-23, and 26 under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent Publication No. 2003/0061035 to Kadambe et al. ("*Kadambe*") in view of U.S. Patent Publication No. 2005/0015205 to Repucci et al. ("*Repucci*") and Swinnen et al., "Detection and multichannel SVD-based filtering of trigeminal somatosensory evoked potentials" ("*Swinnen*"). The Office Action rejects Claim 27 under 35 U.S.C. § 103(a) as being unpatentable over *Repucci* in view of *Swinnen*. These rejections are respectfully traversed.

In *ex parte* examination of patent applications, the Patent Office bears the burden of establishing a *prima facie* case of obviousness. (*MPEP* § 2142; *In re Fritch*, 972 F.2d 1260, 1262, 23 U.S.P.Q.2d 1780, 1783 (Fed. Cir. 1992)). The initial burden of establishing a *prima facie* basis to deny patentability to a claimed invention is always upon the Patent Office. (*MPEP* § 2142; *In re Oetiker*, 977 F.2d 1443, 1445, 24 U.S.P.Q.2d 1443, 1444 (Fed. Cir. 1992); *In re Piasecki*, 745 F.2d 1468, 1472, 223 U.S.P.Q. 785, 788 (Fed. Cir. 1984)). Only when a *prima facie* case of obviousness is established does the burden shift to the Applicant to produce evidence of nonobviousness. (*MPEP* § 2142; *In re Oetiker*, 977 F.2d 1443, 1445, 24 U.S.P.Q.2d

1443, 1444 (*Fed. Cir. 1992*); *In re Rijckaert*, 9 F.3d 1531, 1532, 28 U.S.P.Q.2d 1955, 1956 (*Fed. Cir. 1993*)). If the Patent Office does not produce a *prima facie* case of unpatentability, then without more the Applicant is entitled to grant of a patent. (*In re Oetiker*, 977 F.2d 1443, 1445, 24 U.S.P.Q.2d 1443, 1444 (*Fed. Cir. 1992*); *In re Grabiak*, 769 F.2d 729, 733, 226 U.S.P.Q. 870, 873 (*Fed. Cir. 1985*)).

To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed invention and the reasonable expectation of success must both be found in the prior art, and not based on the Applicant's disclosure. (*MPEP* § 2142).

Claims 1, 11, 18, and 26 recite that a matrix includes "(i) a first column Hankel matrix comprising [a] first plurality of samples in a first portion of the matrix and (ii) a second column Hankel matrix comprising [a] second plurality of samples in a second portion of the matrix." Claim 27 recites that a matrix includes "a first column Hankel matrix in a first portion of the matrix and a second column Hankel matrix in a second portion of the matrix."

The Office Action asserts that *Swinnen* discloses these elements of Claims 1, 11, 18, 26, and 27 and that it would be obvious to modify the proposed *Kadambe-Repucci* combination or *Repucci* with *Swinnen*.

Swinnen recites a singular value decomposition (SVD)-based filtering method. (Page 297, Abstract). The SVD-based filtering method includes five steps. (Page 302, Left column – Page 303, Left column). Steps 1 and 2 involve obtaining data from multiple channels and arranging the data for each channel in a Hankel matrix. (Page 302, Left column). Step 2 also involves concatenating the Hankel matrices into a single larger Hankel matrix. (Page 302, Right column). Step 3 involves performing singular value decomposition, and step 4 involves setting the smallest singular values to zero. (Page 302, Right column). Step 5 involves restoring the Hankel structure by taking the average of each anti-diagonal in various matrices and equalizing the elements in the diagonal with the average value. (Page 303, Left column). Steps 3 through 5 could be repeated multiple times. (Page 303, Left column).

Swinnen recites a technique where Hankel matrices are used and concatenated. However, the Office Action fails to explain how or why the use of Hankel matrices in *Swinnen* could be incorporated into the techniques of *Kadambe* or *Repucci*.

The alleged motivation for modifying *Kadambe* or *Repucci* with *Swinnen* is to “improve the signal to noise ratio[] and extraction of the characteristic components of the original signal” (as asserted in *Swinnen* at page 301, Section 4.2). However, this portion of *Swinnen* (which is relied upon in the Office Action) is specifically referring to the entire SVD-based filtering method, not simply the use and concatenation of Hankel matrices. In other words, for these benefits to be obtained in *Kadambe* or *Repucci*, the entire SVD-based filtering method of *Swinnen* would need to be incorporated into *Kadambe* or *Repucci*.

Swinnen is crystal clear – Hankel matrices are concatenated into a larger Hankel matrix, and the larger Hankel matrix is then processed in a specified manner to produce SVD-based filtered results. *Swinnen* does not project the larger Hankel matrix into an orthogonal space or perform canonical QR-decomposition on the larger Hankel matrix. *Swinnen* also does not use the projected matrix, an orthogonal matrix and an upper triangular matrix (from the canonical QR-decomposition), or the projection of the matrix to at least partially isolate one portion of a signal from another portion of the signal or to at least isolate one or more disturbance effects in the signal.

The only way the Patent Office can rely on *Swinnen* to reject the claims is if the Patent Office can show that it is obvious to extract certain individual steps from the overall SVD-based filtering method of *Swinnen* and incorporate those individual steps into *Kadambe* or *Repucci*. The Patent Office has not and cannot make this showing. The Office Action provides absolutely no motivation why individual steps would be extracted from the SVD-based filtering method of *Swinnen* and used in *Kadambe* or *Repucci*. Moreover, there is absolutely no reason to generate a larger Hankel matrix as recited in *Swinnen* and then, without performing the remaining steps disclosed in *Swinnen*, process the larger Hankel matrix in *Kadambe* or *Repucci*. As a result, the Office Action fails to provide a suggestion or motivation for combining only part of the SVD-based filtering method of *Swinnen* with the techniques used in *Kadambe* and *Repucci*.

For these reasons, the proposed *Kadambe-Repucci-Swinnen* combination and the proposed *Repucci-Swinnen* combination fail to disclose, teach, or suggest the Applicant's invention as recited in Claims 1, 11, 18, 26, and 27 (and their dependent claims).

The dependent claims are patentable over the proposed *Kadambe-Repucchi-Swinnen* combination and the proposed *Repucchi-Swinnen* combination based on their dependence from allowable base claims and in light of their own recitations. For example, Claims 6, 15, 22, and 23 all recite that a matrix includes a first column Hankel matrix and a second column Hankel matrix, where one column Hankel matrix is a “backward column Hankel matrix” and the other column Hankel matrix is a “forward column Hankel matrix.”

The Office Action asserts that *Swinnen* discloses the use of backward and forward column Hankel matrices at page 302, left column. However, the cited portion of *Swinnen* simply notes that a “latter operation destroys the rank property” of a matrix. (*Page 302, Left column, First paragraph*). The “latter operation” is described in the immediately preceding sentence in *Swinnen*, which notes that a “matrix is reduced to lower rank p via a truncated SVD after which the Hankel structure is restored by averaging the elements along the anti-diagonals.” (*Page 301, Right column, Last paragraph - Page 302, Left column, First paragraph*). There is absolutely nothing in this portion of *Swinnen* that refers to both a “backward column Hankel matrix” and a “forward column Hankel matrix.” In fact, *Swinnen* appears to imply that all Hankel matrixes used in *Swinnen* are “forward” Hankel matrixes (compare the forward column Hankel matrix in Figure 3A of the Applicant’s disclosure to the equation for Y_j in *Swinnen*).

For these reasons, the proposed *Kadambe-Repucchi-Swinnen* combination fails to disclose, teach, or suggest the Applicant’s invention as recited in Claims 6, 15, 22, and 23.

Accordingly, the Applicant respectfully requests withdrawal of the § 103 rejections and full allowance of Claims 1-27.

SUMMARY

The Applicant respectfully asserts that all pending claims in this application are in condition for allowance and respectfully requests full allowance of the claims.

If any issues arise or if the Examiner has any suggestions for expediting allowance of this application, the Applicant respectfully invites the Examiner to contact the undersigned at the telephone number indicated below or at *wmunck@munckbutrus.com*.


The Commissioner is hereby authorized to charge any fees connected with this communication (including any extension of time fees) or credit any overpayment to Deposit Account No. 50-0208.

Respectfully submitted,

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